SONY

NTSC/PAL

MSW-900/900P

MPEG IMX™

The entrance to the open MPEG world

Ever since the launch of the Betacam™ system concept 20 years ago, Sony half-inch camcorders have set distinctive milestones in the evolution of news reporting and program production operations. The analog Betacam and Betacam SP™ formats introduced a new freedom for mobile acquisition in ENG (Electronic News Gathering) and EFP (Electronic Field Production), and the Digital Betacam™ format was the subsequent innovation that brought true 4:2:2 digital recording into the field. Today, both analog and digital formats remain in service in virtually every type of program origination, offering a level of reliability and performance that only Sony Betacam technology provides.

The wide acceptance of the Digital Betacam format paved the way to the subsequent development of a digital replacement for the analog Betacam format in the broadcast newsgathering world, with the unique advantage of using MPEG technology for data rate efficiency and high quality video capture. This was the Betacam SX™ format series equipment, which is now known as the 'digital workhorse' for use in the arduous environment of ENG operations.

The rapid success of Betacam SX gear used in ENG applications, together with the advent of DTV distribution and transmission, was the motivation behind the development of a higher bit-rate MPEG 4:2:2P@ML format for use in broadcast studio operations. Through close collaboration between key manufacturers and research centers, the prime goal of achieving seamless interoperability between equipment to provide an open, end-to-end, MPEG-based solution was achieved. The conclusion was to utilize an I-frame only, MPEG 4:2:2P@ML infrastructure to provide the highest level of efficiency throughout the entire programming chain. Sony indicated its commitment to the MPEG-based infrastructure with the introduction of a range of I-frame only, MPEG 4:2:2P@ML equipment, represented by the MPEG IMX™ studio VTRs, Video Servers, XPRI™ NLE, and MPEG transcoders.

To complete this picture, Sony has now introduced the MSW-900 MPEG IMX camcorder. The MSW-900 originates 50 Mb/s 4:2:2 digital video with four channels of digital audio by combining all the benefits of I-frame only, MPEG 4:2:2P@ML recording with the two decades of Sony experience with 1/2-inch broadcast camcorders. It inherits the proven advantages of the Betacam format series, providing the same level of reliability, mobility and operability for which they are famous. In addition, new and unique camera and recording features are also part of the MSW-900 design.

The MSW-900 is poised to play a vital role as the primary acquisition tool for a complete 50 Mb/s MPEG-based system solution.

*Two models of the MSW-900 are available: the MSW-900 for NTSC and the MSW-900P for PAL.

CHECK

Innovative performance in an MPEG IMX camcorder

High picture quality using MPEG 4:2:2P@ML 50 Mb/s I-frame compression

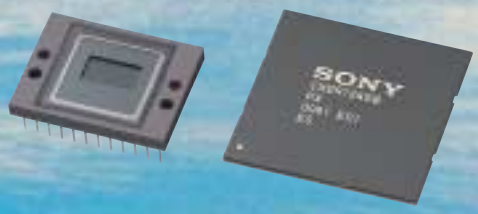
The MSW-900 employs MPEG 4:2:2P@ML recording, which uses a bit rate of 50 Mb/s to provide outstanding picture quality. Using MPEG technology, the MSW-900 integrates directly with other MPEG devices. Combining this high picture quality with MPEG interoperability, the MSW-900 seamlessly works in a wide range of applications including ENG and EFP.

Newly developed Power HAD™ EX CCD

The latest Sony development in CCD technology, the Power HAD EX, is incorporated in the MSW-900 camcorder. This CCD realizes an incredible pixel count of one million picture elements, a high signal-to-noise ratio of –65 dB (NTSC)/–63 dB (PAL) and an extremely low smear level (–140 dB, typical). Furthermore, the remarkably high sensitivity of f11 ensures pictures of the highest quality – even when shooting under low lighting levels.
The MSW-900 can output both 525 (NTSC version) or 625 (PAL version) interlaced and progressive scan signals to suit emerging programming needs.

New high-performance DSP LSI

The MSW-900 employs a newly developed high-performance Digital Signal Processing LSI. This device provides comprehensive and precise control over the high quality images produced by the camcorder. It builds on the sophisticated DSP technology developed for Digital Betacam camcorders, making available the many attractive features of these camcorders such as accurate tonal reproduction and colorimetry, the storage of complex parameter setups, and a reduction in power consumption.



Versatile interfaces

The MSW-900 provides an analog composite output as standard, with an SDI output board (the MSDW-902) available as a plug-in option. An optional composite input board (the MSDW-904) is also available for pool feed applications. These optional boards install within the camcorder chassis to eliminate the need for an external camera adaptor unit, maintaining the compactness and balance of the camcorder.

Compact, lightweight, and low power consumption

The MSW-900 is designed to be extremely compact and lightweight, providing a high level of mobility in the field. It weighs approximately 5.3 kg (11 lb. 10 oz.) including a viewfinder, microphone, BP-L60A Li-ion battery and BCT-60MX cassette tape.
With its new-generation LSI, the camcorder achieves a low power consumption of just 27 W.

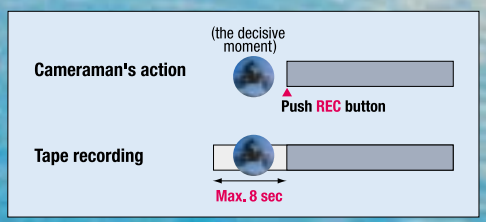
Extended recording times

The MPEG IMX camcorder provides long recording times, up to 60 minutes for NTSC signals and 71 minutes for PAL. These are achieved by the efficient MPEG compression algorithm, which provides the optimum balance between image quality and recording time.

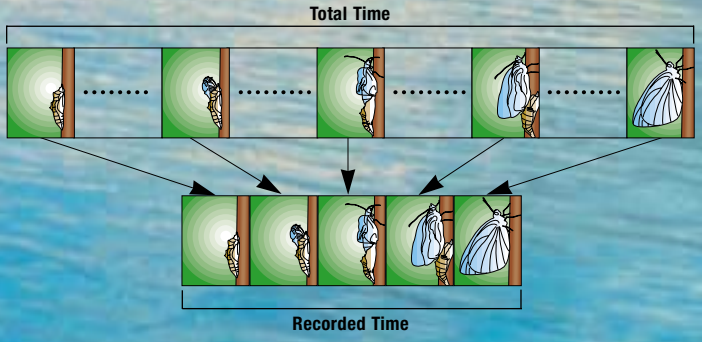
Loop/interval recording

The MSDW-903 Picture Cache Board allows two new and extremely useful features to be incorporated into the MSW-900.
Loop recording is a useful function that allows audio and video signals to be buffered in a memory until the Record button is pressed. The signals buffered in the memory are recorded to tape at the instant the REC button is pressed. This capability can avoid the loss of important scenes that may occur before the operator has time to press the Record button. It is especially helpful for news gathering applications where a vital, one-off shot, would otherwise be missed. Up to eight seconds of data are always buffered for recording.
Interval recording is also a unique feature of the MSW-900 camcorder, and operates in a choice of two modes. In manual mode, up to eight frames are recorded every time the Record button is pressed. In auto mode, the camera records frames at predetermined intervals over a predetermined time. In both modes the frames are initially stored in the Picture Cache board and when this is full its contents are copied to tape. This allows recordings to be made over very long time periods on a single tape and minimizes wear of the tape drive mechanism.

Loop recording



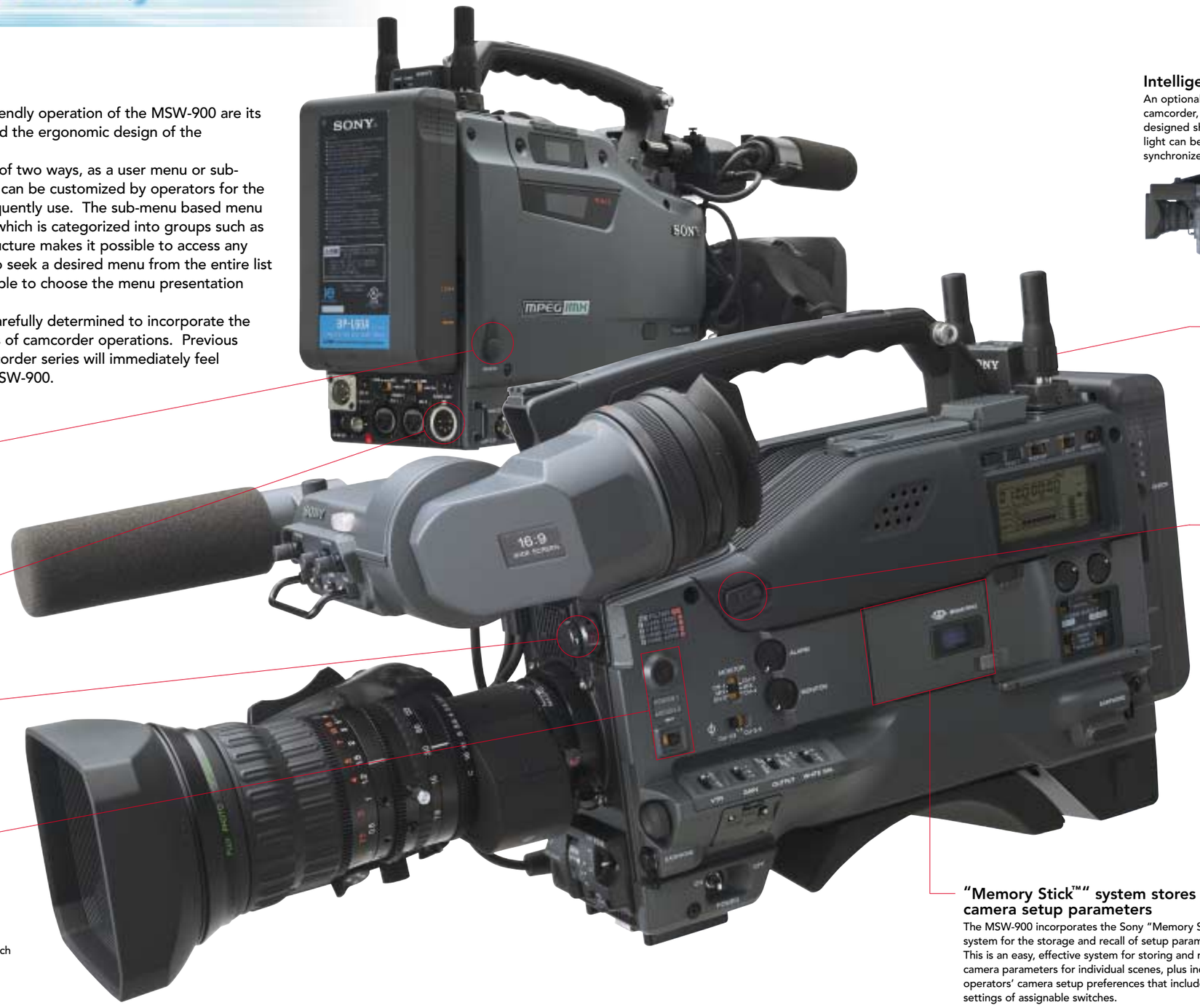
Auto interval recording



Operational versatility

User-friendly controls

Two important aspects of the user-friendly operation of the MSW-900 are its carefully designed menu structure and the ergonomic design of the camcorder body.
The menu can be displayed in either of two ways, as a user menu or sub-menu based system. The user menu can be customized by operators for the fastest access to the menus they frequently use. The sub-menu based menu makes all menus accessible, each of which is categorized into groups such as paint, file and maintenance. This structure makes it possible to access any menu quickly, eliminating the need to seek a desired menu from the entire list of menus. Individual operators are able to choose the menu presentation that they feel comfortable to use.
The elegant body design has been carefully determined to incorporate the experience gained from two decades of camcorder operations. Previous operators of any Sony Betacam camcorder series will immediately feel comfortable and at home with the MSW-900.



Camera control via 8-pin remote connector

An optional remote control unit, the Sony RM-B150, makes it possible to remotely control the camcorder's basic functions via its 8-pin remote connector.

Two-channel audio output

A two-channel audio line output is available from the 5-pin XLR connector on the rear of the camcorder. This provides two analog audio output channels, which are selectable between either Channel-1/2 or Channel-3/4.

Dual optical filters

The MSW-900 is equipped with dual optical filters for Color Correction (CC) and Neutral Density (ND) for flexible color and exposure control. The CC filters are CROSS, 3200K, 4300K, and 6300K while the ND filters are CLEAR, 1/4ND, 1/16ND, and 1/64ND.

Assignable function

Functions frequently used in the field can be assigned to a push button and a simple slide switch, allowing the operator to make rapid changes under field conditions. The following functions can be assigned.

- **Push button:** off, loop record on/off, test out character on/off, marker on/off, re-take, ATW, return video, lens return, record switch, turbo switch
- **Slide switch:** off, loop record on/off, test out character on/off, marker on/off, cam/ext

*Lens, battery and WRR-855A/855B are optional.

Intelligent light system

An optional portable light (max. 50 W) can be directly attached to the camcorder, using a standard lighting connector and a specially designed short cable for operation on the comcorder's battery. The light can be switched on and off manually, or automatically synchronized with the REC Start function of the camcorder.

Slot-in mechanism accommodates wireless microphone receiver

An optional Sony wireless microphone receiver, the WRR-855A/855B, slots directly into the camcorder body without requiring a cable connection. This maintains camcorder balance and keeps the body compact to avoid any loss of mobility.

Turbo gain

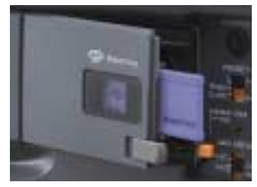
The MSW-900 provides the Turbo Gain function, boosting the gain level up to +48 dB at the touch of a button. This makes it possible to shoot in extremely low light conditions.

High-quality audio recordings

Audio can be recorded in either 20 or 16-bit resolution. The recording format provides up to four channels of 20-bit mode and eight channels in 16-bit mode. Up to four channels can be recorded in either mode by the camcorder.
If recordings are made on channels 1-4 in the 8-channel, 16-bit mode, then channels 5-8 are available for use with a studio VTR. The inputs to audio tracks 1-4 can be accessed by any four microphones connected to the camcorder including the front microphone, and additional wired or wireless microphones.
The camcorder utilizes a 20-bit A/D converter instead of the 16-bit type to maximize sound quality.

"Memory Stick™" system stores camera setup parameters

The MSW-900 incorporates the Sony "Memory Stick" system for the storage and recall of setup parameters. This is an easy, effective system for storing and recalling camera parameters for individual scenes, plus individual operators' camera setup preferences that include the settings of assignable switches.



MEMORY STICK ™

Creative versatility

Multi-matrix function

Unlike conventional color correction or matrix control, the Multi-matrix function allows color adjustments to be applied over a color and/or hue range as specified by the operator. The color spectrum is divided into 16 areas of adjustment, where the hue and/or saturation of each area can be adjusted. This provides interesting in-camera color effects – similar to secondary color correction.

Multi-matrix ON

TruEye™ processor

The Sony TruEye processor is one of the most innovative features of Sony digital signal processing technology. This technology makes it possible to virtually eliminate hue distortion, particularly obvious in highlight conditions that result from conventional RGB analog or digital processing. By processing the video signal data at three levels – brightness, hue and saturation – similar to how the human eye works, the TruEye features assists in the reproduction of natural skin tones.

Conventional Video Equipment

TruEye

Triple Skin Tone Detail control

Skin Tone Detail allows control of image enhancement within user specified color tones. The MSW-900 camcorder allows enhancement to be set independently for up to three distinct color and/or hue ranges.
The conventional use of Skin Tone Detail correction is to reduce the image enhancement in areas of skin tone. With the MSW-900, correction is not restricted to areas of skin tones and can be set to apply to any three color areas. Image enhancement within those three areas can be increased or decreased relative to the overall image enhancement of a given scene.

Electronic Soft Focus

The Electronic Soft Focus included in the camcorder applies an effect similar to using an optical soft-focus filter – but in a much more convenient way. Electronic Soft Focus uses the detail signal to reduce, rather than increase, the sharpness of the picture. By subtracting the detail signal from the original signal (as opposed to adding it as in conventional image enhancement), Electronic Soft Focus is able to provide a picture that is "softer" than that achieved when detail is switched off completely. Electronic Soft Focus can be used in conjunction with Skin Tone Detail to only change the sharpness within a specific color or hue range.

Selectable gamma table

A selectable gamma table is provided to easily give a specific look to a picture by selecting from several fixed gamma patterns.

Auto Tracing White Balance (ATW)

The MSW-900 offers an Auto Tracing White Balance (ATW) function that automatically adjusts the camera's color temperature in real time with a change of the lighting. This is especially useful when a shoot is performed across different environments, such as from indoors to outdoors.

Color temperature control

In addition to the optical color filters, digital color temperature control is available to give a 'warmer' or 'colder' look to the picture. Combined use of these two color temperature control methods allows operators to meet their creative needs.

Other operational features

Shot mark and shot data handling

The MSW-900 is capable of recording shot marks (time codes for 'good' shots) and shot data (date, shot ID, cassette number etc.) to the tape. When a tape containing shot marks is played back on an MSW-2000 series VTR, the shot mark positions are automatically detected and a list of all marks is generated for display on a video monitor. This allows operators to easily select and cue-up to the scene of interest.
The shot marks and shot data can be utilized for a wide range of applications to provide more efficiency in the production chain.

MSW-900 Menu

MSW-2000 Series VTR

MSW-2000 Series Time Code List

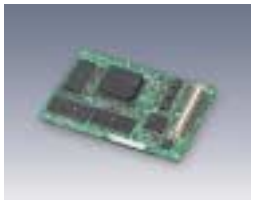
Tele-File™ system

The Sony Tele-File system stores and recalls various types of production data, such as shot data and shot marks, onto and from a cassette label with a built-in memory IC. The camcorder is equipped as standard with a Tele-File reader/writer module, allowing this information to be managed electronically. Use of the Tele-File system can significantly raise efficiency in the subsequent editing process and management of archives.

A wide range of optional accessories

A wide variety of accessories are available to greatly increase the versatility and operational performance of the MSW-900, making it suitable for many different applications. Three types of plug-in boards, camera adaptors to add various interfaces, a compact remote controller, several types of viewfinders and a range of audio accessories are all available. The available plug-in boards are the SDI output board MSDW-902, the picture cache board MSDW-903, and the analog composite input board MSDW-904. In addition to the supplied 2-inch viewfinder, 1.35-inch 16:9 color and 1.5-inch B/W types are offered as options. Three types of camera adaptors are available: the CA-701 for SDI output and four-channel audio input, CA-702/702P for external SDI input and 26-pin connection with portable VTRs, and CA-755/755P for use with camera control units (CCU) via a triax connector.

MSDW-902,
SDI output board



MSDW-903,
Picture cache board

MSDW-904,
Analog composite input board

CA-701,
Camcorder adaptor

CA-702/702P,
Camcorder adaptor

CA-755/755P,
Camcorder adaptor

BVF-VC10W, 1.35-inch 16:9
color viewfinder

BVF-55/55CE,
5-inch B/W viewfinder

BKW-401,
Viewfinder rotation bracket

RM-B150,
Remote control unit

CCU-550A/550AP, Camera
control unit for CA-755/755P

AC-550/550CE, AC adaptor

AC-DN2B, AC adaptor

BP-L60A/L90A, Battery pack

BP-M50/M100, Battery pack

BC-M50, Battery charger for
BP-L60A/L90A/M50/M100

BC-L120, Battery charger for
BP-L60A/L90A

VCT-14, Tripod adaptor

BCT-6MX/12MX/22MX/32MX/
60MX, MPEG IMX tapes

MSA-8A/16A/32A/64A,
Memory Stick

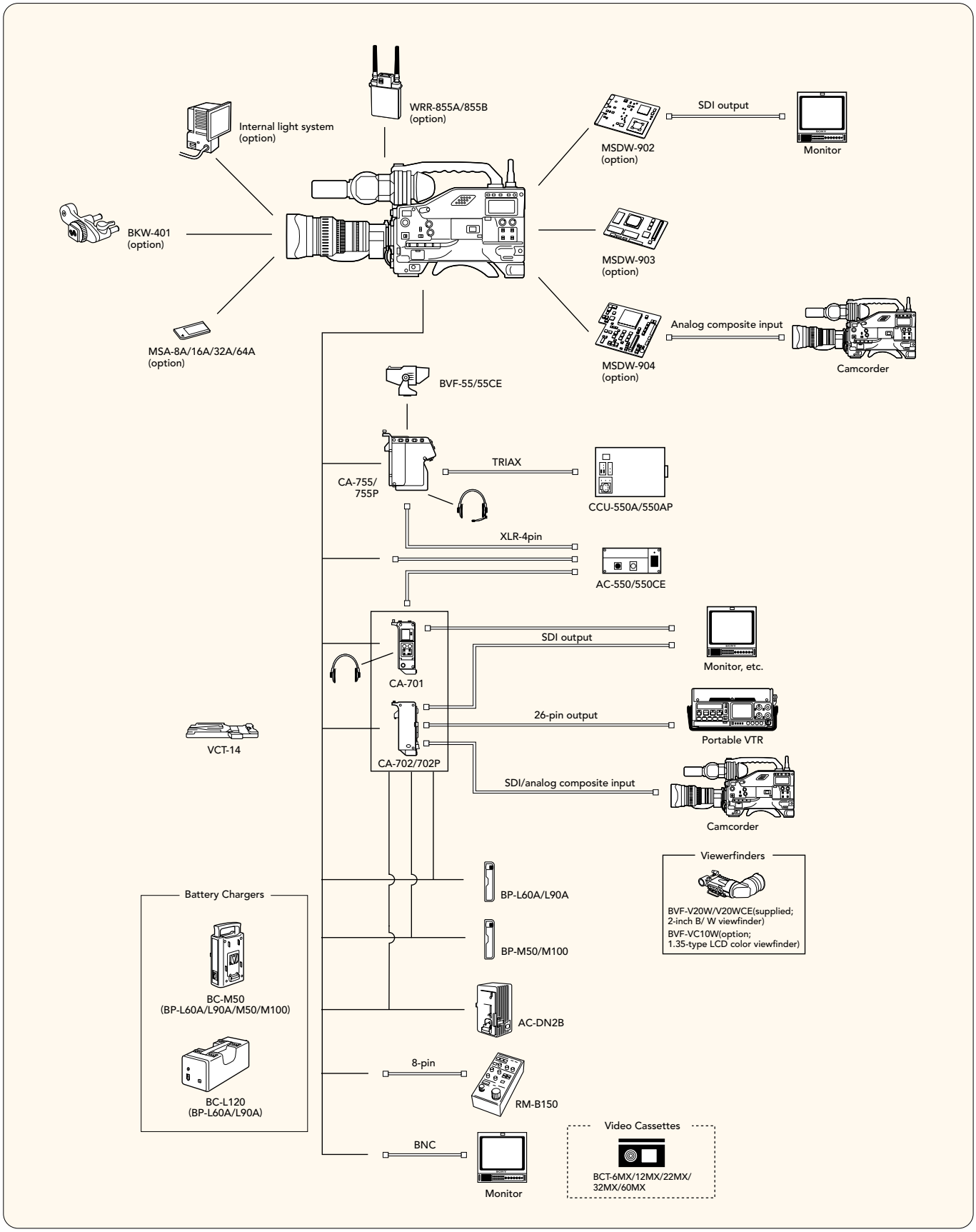
WRR-855A/855B, Wireless
microphone receiver

WRR-862A/862B, Dual
diversity microphone receiver

CCXA-53, Audio cable

1-547-341-12, Fog-proof filter
A-8262-537-A, Viewfinder Eye-piece (High magnification)
A-8262-538-A, Viewfinder Eye-piece (Low magnification)
A-8267-737-A, Viewfinder Eye-piece (Standard magnification
with special compensation for aberrations)
A-8314-798-A, Viewfinder Eye-piece (high performance, x3)
X-3608-271-1, Standard viewfinder lens
A-8278-057-A, Mounting bracket for WRR-862A/862B

System configuration



Specifications

		MSW-900	MSW-900P
General	Mass	Approx. 3.5 kg (7 lb 11 oz) 5.3 kg (with VF, Mic, BCT-60MX, BP-L60A) (11 lb 10 oz)	
	Power requirements	DC 12 V +5.0 V/-1.0 V	
	Power consumption	Approx. 27 W	
	Operating temperature	0 to 40 °C (+32 °F to +104 °F)	
	Storage temperature	-20 to +60 °C (-4 °F to+140 °F)	
	Humidity	25 to 85% (relative humidity)	
	Continuous operating time	Approx. 135 min w/BP-L60A Approx. 200 min w/BP-L90A	
Signal inputs	Genlock video	BNC type x1, 1.0 Vp-p, 75 Ω	
	Time code input	BNC type x1, 0.5 to 18 Vp-p, 10 kΩ	
	Audio (CH-1/2)	XLR-3-31 type x2, -60 dBm/+4 dBm selectable, high impedance, balanced	
	Mic input	XLR-3-31 type x2, -60 dBm/+4 dBm selectable, high impedance, balanced	
Signal outputs	Video output	BNC type x1, 1.0 Vp-p, 75 Ω	
	Video test output	BNC type x1, 1.0 Vp-p, 75 Ω	
	Time code output	BNC type x1, 1.0 Vp-p, 75 Ω	
	Earphone	Minijack x2	
	Audio output (CH-1/CH-2)	XLR-5-pin male (stereo)	
Others	Lens	12-pin	
	Remote	8-pin	
	Light	2-pin, DC 12 V, max. 50 W	
	DC input	XLR-4-pin (for the optional AC-550/550CE)	
	DC output	4-pin (for wireless microphone receiver), DC 12 V	
	Camcorder adapter	40-pin	
	Wireless receiver input	D-Sub 15-pin	
VTR section	Recording format	MPEG IMX	
	Tape speed	64.467 mm/s	53.776 mm/s
	Playback/Recording time	Max. 60 min w/BCT-60MX cassette	Max. 71 min w/BCT-60MX cassette
	Fast forward time	Approx. 5 min. w/BCT-60MX	
	Rewind time	Approx. 5 min. w/BCT-60MX	
	Recommended tape	Sony MPEG IMX S cassette (BCT-6MX/12MX/22MX/32MX/60MX)	
Digital video performance	Sampling frequency	Y: 13.5 MHz, R-Y/B-Y: 6.75 MHz	
	Quantization	8 bits/sample	
	Error correction	Reed-Solomon code	
	K-factor (2T pulse)	Less than 1%	
	Y/R-Y/B-Y delay	Less than 15 ns	
Digital audio performance	Sampling frequency	48 kHz (synchronised with video)	
	Quantization	20/16bits/ sample (selectable)	
	A/D and D/A quantization	A/D:20 bits/sample, D/A:16 bits/sample	
	Frequency response	20 Hz to 20 kHz, +0.5 dB/-1.0 dB	
	Dynamic range	More than 85 dB (emphasis ON)	
	Distortion (at 1 kHz, emphasis ON, reference level)	Less than 0.08%	
	Cross talk (at 1 kHz, reference level)	Less than -70 dB	
	Wow & flutter	Below measurable limit	
	Head room	20 dB (ex-factory setting)	
	Emphasis (ON/OFF selectable)	T1=50 µs, T2=15 µs	
	* The specifications given above were measured via CA-701/702 Camcorder Adapter or MSDW-902 SDI output board.		
Camera section	Pickup device	3-chip 2/3-inch type 16:9 widescreen Power HAD EX CCD	
	Total picture elements	1038(H) x 1008(V)	1038(H) x 1188(V)
	Optical system	F1.4 prism	
	Built-in optical filters	1: Clear, 2: 1/4ND, 3: 1/16ND, 4: 1/64ND, A: CROSS, B: 3200K, C: 4300K, D: 6300K	
	Shutter speed	1/100, 1/125, 1/250, 1/500, 1/1000, 1/2000 (s)	1/60, 1/125, 1/250, 1/500, 1/1000, 1/2000 (s)
	Lens mount	Special bayonet mount	
	Sensitivity (2000 lx, 89.9% reflectance)	F11 (typical)	
	Minimum illumination	Approx. 0.15 lx (F1.4 lens, +48 dB turbo gain)	
	Smear level	-140 dB (typical)	
	S/N ratio	-65 dB (typical)	-63 dB (typical)
	Vertical resolution	400 TV Lines/450 TV Lines(EVS)	480 TV Lines/530 TV Lines(EVS)
	Registration	0.05% (all zones, w/o lens)	
	Geometric distortion	Below measurable level (w/o lens)	
	Warm-up time	2 s	
	Modulation depth at 5MHz	70%(16:9, typical)/55%(4:3, typical)	
Viewfinder	CRT	2.0-inch monochrome	
	Controls	BRIGHT, CONTRAST, PEAKING controls, TALLY, ZEBRA, DISPLAY switches	
	Horizontal resolution	450 TV lines (16:9)	
	Microphone	Ultra-directional (Detachable)	
Supplied accessories		Operation manual (x1) Viewfinder (x1) Lens cap (x1) Shoulder belt (x1) Monaural microphone (x1) XLR connector cap (x4)	

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